

SPAWNING OF SOME IMPORTANT COLDWATER FISH OF THE GARHWAL HIMALAYA¹

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(With a plate)

The present study gives an account of the spawning of some important coldwater fish of the Garhwal Himalaya. Most of them have one breeding season and breed in summer, monsoon and postmonsoon months. However, *Schizothorax* species show a long spawning season (July to January) and their breeding is at a peak from September to November. *Puntius chilinoides* and *P. hexastichus* spawn twice a year during two different but relatively short spawning periods, May-July and December-January. Increased pH and flooding (turbidity) is necessary for the spawning of *Noemacheilus*, *Glyptothorax*, *Pseudecheneis* and *Tor* species of the Garhwal streams. High concentration of dissolved oxygen and relatively low pH are necessary for the spawning of *Schizothorax*, *Labeo* and *Barilius*. Besides flooding and varying values of pH and oxygen content of the waters, a varying suitable temperature is also necessary for the spawning of these species. The natural breeding grounds of these fishes are also disturbed by the transportation of timber in the Garhwal rivers.

There is little or no information available on the breeding habits of coldwater fishes of the Garhwal Himalayas. Hence this study was undertaken.

MATERIAL AND METHODS

The period of spawning as inferred by the presence of mature ova and testes in the body cavity was confirmed by actually finding the spawn, fry and fingerlings. In some cases the ova attached to stones, lying in a particular breeding place were collected and counted (Plate 1). The breeding site of a particular fish was decided by the occurrence of its eggs and fry in that place. The temperature, pH, depth, gradient, current, and dissolved oxygen

of the water in the breeding ground were recorded. The specimens were collected and examined from different snow-fed and non-snow-fed rivers and streams.

This study was made in respect of the following fishes:

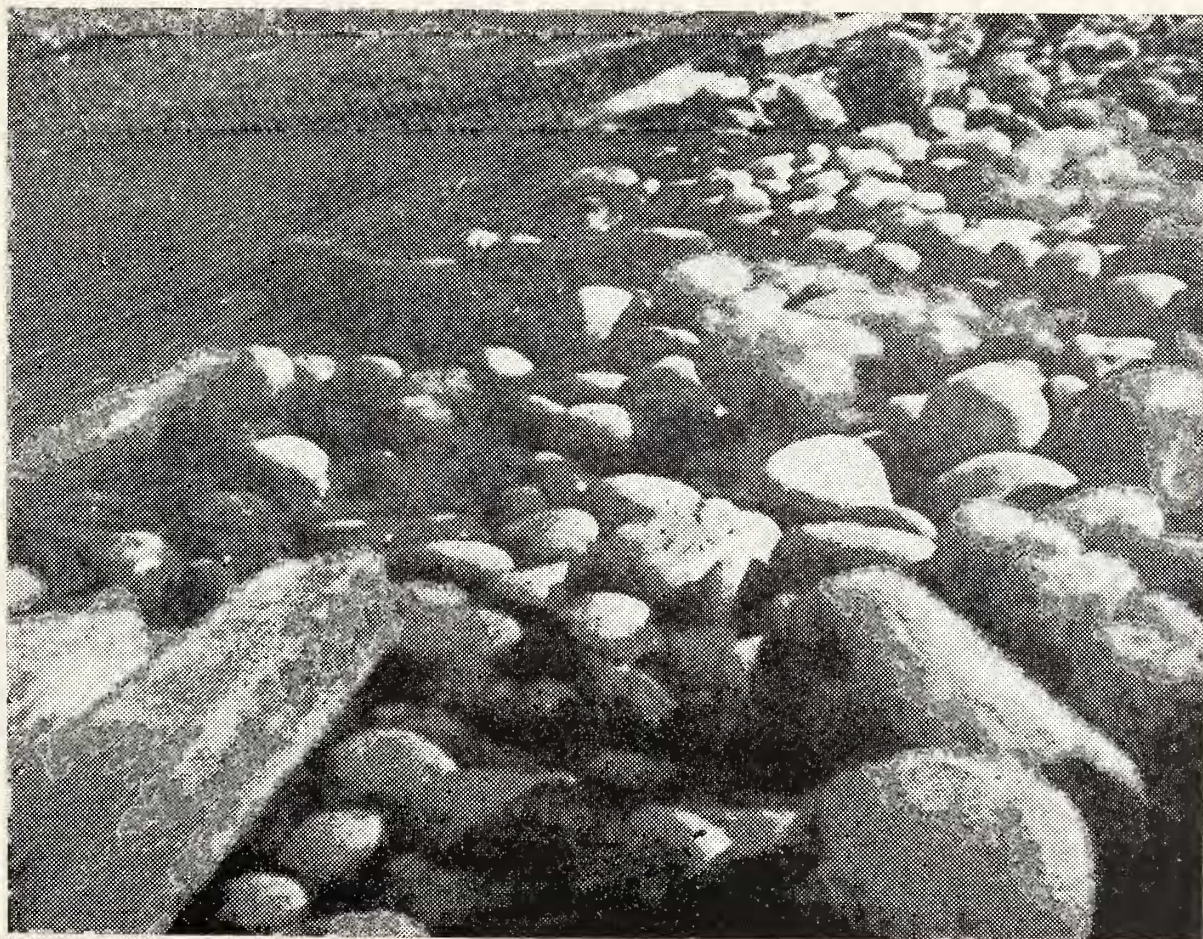
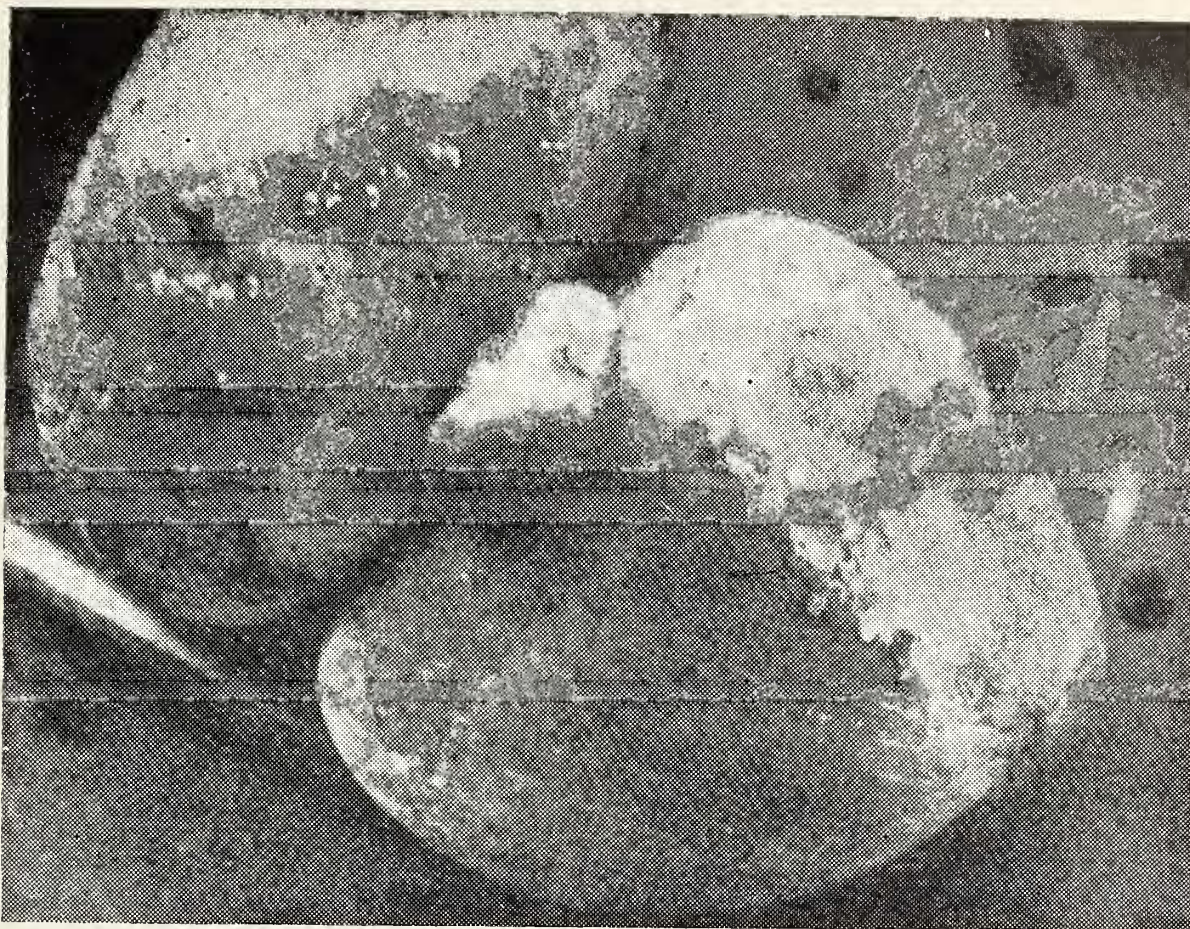
Schizothorax sinuatus (Heckel), *S. plagiostomus* (Heckel), *S. richardsonii* (Gray), *Tor tor* (Ham.), *T. putitora* (Ham.), *Labeo dyocheilus* (McClell.), *L. dero* (Ham.), *Barilius bendelisis* (Ham.), *B. vagra* (Ham.), *B. barna* (Ham.), *Puntius chilinoides* (McClell.), *P. hexastichus* (McClell.), *Noemacheilus montanus* (McClell.) *M. multifasciatus* (Day), *N. rupicola* (McClell.), *Glyptothorax pectinopterus* (McClell.), and *Pseudecheneis sulcatus*, (McClell.).

1. *Schizothorax sinuatus*, *S. plagiostomus* and *S. richardsonii*. These species are most common in snow-fed rivers and streams of this region. It was found that they start spawning gradually from July and end in January.

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Above: Showing fish ova attached to stones.
Below: Showing destruction of ova in the breeding ground by timber logs.

The peak spawning period was observed in September-October and November. In these months the water velocity, temperature, and dissolved oxygen remain quite favourable for their breeding. They breed in shallow running semistagnant water along the banks of the rivers among gravel and stone. The eggs remain attached to stones in batches. The water temperature of the breeding ground ranged between 7.8 and 15.6°C, the atmospheric temperature was 12.9° to 31.2°C, pH of water was between 7.0 and 8.2 dissolved oxygen 9.0 to 18.1 ppm. The depth of breeding ground varied from 25 to 32 cm. The gradient was less and velocity was observed to be 0.496 metre/second.

2. **Tor tor** and **T. putitora**: These species spawn from April to July when the water of Alaknanda becomes turbid due to the melting of snow at the peaks. They move from the deeper waters or lower regions upward for breeding. This type of local movement was noticed right from April, when the water starts becoming turbid. It is believed that mature specimens travel upstream from Rishikesh or Hardwar, first to the upper reaches of the Ganga and then to Alaknanda and Bhagirathi for breeding. The eggs are laid on and under stones at a depth of 35 to 50 cm where the gradient is less. The water temperature of the breeding place was from 15° to 17.5°C, atmospheric temperature 26.1° and 31.2°C, pH of the water 7.0 to 8.2 and dissolved oxygen 9.0 to 9.9 ppm. The fertilized eggs were slightly brown in colour and found attached to the stones and rocks and other objects such as logs, etc. However, we could not get adult *Tor* species in Alaknanda after July-August when only large number of fry and fingerlings were found in the backwaters and sidestreams of the Alaknanda and Bhagirathi rivers. It appears that after spawning the adults move

down the Ganga probably due to the effect of the low water temperature. Thus we could observe the breeding only from April to July.

3. **Labeo dyocheilus** and **L. dero**: These two species abound in Alaknanda, Bhagirathi and Pinder, etc. from March to June when they come from Ganga for the purpose of breeding. During these months, they are found with mature gonads. The eggs are laid on and among the stones towards the bank of the river at a depth of 30 to 35 cm in slow running water. The water temperature in the breeding grounds was 12.6° to 17.5°C, atmospheric temperature 26.8° (in April) to 31.2°C (in June), maximum pH was 8.2 and dissolved oxygen from 9.3 to 9.9 ppm. The velocity of water was 0.616 to 1.234 metre/sec. Thus, they prefer clear shallow water for breeding. The fertilized eggs were somewhat greenish in colour.

4. **Barilius bendelisis**, **B. vagra** and **B. barna**: These species always prefer small rivers and streams, where the water is clear and shallow with high percentage of dissolved oxygen. They do not survive in polluted water. In this investigation it was found that these species breed from April to June. The breeding grounds were observed in Nayar, Khoh and in the side stagnant waters of Alaknanda. These small fishes are found schooling in abundance and lay their eggs in shallow pockets of water under stones and weeds (algae), as well as in the sand mixed gravel bed at a depth of 15 to 28 cm. The water temperature of the breeding grounds ranged from 20.5° to 22.5°C with the pH from 7.0 to 7.3. The dissolved oxygen was 9.5 to 10.2 ppm. The water was semistagnant, with low velocity (0.197 to 0.204 metre/second) and less gradient.

5. **Puntius chinoides** and **P. hexastichus**: The two species are very common in Nayar,

Mandakini and Pindar rivers and their breeding period was noticed to be from May to July and December to January. However, the actual breeding grounds of these species could not be located. But from the fry it was estimated that they breed in shallow water under stones and rocks, with the water temperature at 8.9°C, pH of water 7.0 and dissolved oxygen 16.8 ppm. The gradient and velocity of water was also low.

6. *Noemacheilus montanus*, *N. rupicola* and *N. multifasciatus*: These species spawn from July to August in small streams and rivulets. Being small in size, their breeding ground could not be located. But it is almost definite that they breed in small streams and rivulets and not in large snow-fed rivers like Alaknanda, Bhagirathi, etc.

7. *Glyptothorax pectinopterus*: This species breeds from April to August and is quite common in streams throughout the year. In Alaknanda, Bhagirathi and Pinder, etc. it occurs in abundance in the rainy season. Probably having been swept in from small streams and rivulets by the swift current. Its breeding niches could not be observed due to the increased water level and velocity (2.493 metres|second).

8. *Pseudecheneis sulcatus*: *P. sulcatus* is found in snow-fed streams all the year round, but in Alaknanda, Pindar, Bhagirathi and Jamuna it is available after April, when the water becomes turbid. Its spawning period was observed to be from April to August. The mature testes are branched. In female the abdomen is bulged out by large number of eggs. However, its breeding ground could not be located due to the high speed of water in the rainy season.

DESTRUCTION OF EGGS

During the course of this study it was found that the breeding grounds in Alaknanda and

Nayar are disturbed by the floating of timber logs (Plate 1). In winter and summer the logging is most common in Alaknanda and Nayar. In this period most of the fishes are in spawning stage, for instance *Schizothorax* species breed from September to January and the *Puntius* species from December to January. The *Tor* and *Labeo* species breed from April to June-July. We have noticed that the logs that float in the main current of the river sometimes reach the banks of the river and strike the stones and rocks, and thus crush thousands of eggs and disturb the natural breeding grounds. It was estimated that about 26% eggs are damaged by this type of transportation of the timber. (Table 1).

TABLE 1
DESTRUCTION OF FISH EGGS BY TIMBER IN
ALAKNANDA RIVER

Spot No.	Nature of substratum	Total eggs examined	No. of living eggs	No. of damaged eggs	Percentage of damaged eggs.
1.	Stony	347	235	112	32.27
2.	Stony	286	160	126	44.05
3.	Stony & rocky	360	292	68	18.88
4.	Stony	198	178	20	10.10
5.	Stony	307	307	nil	nil
6.	Stony & Rocky	401	401	nil	nil

DISCUSSION

According to this study most of the fishes of the Garhwal Himalaya breed in the summer and monsoon months. However, only *Puntius chilinoides* and *P. hexastichus* breed twice a year, i.e., from May to July and December to January. Of all the species included in this study, *Schizothorax* spp. have the longest